Roentgen Equivalent Man (Rem) Encyclopedia Article

Roentgen Equivalent Man (Rem)

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Roentgen Equivalent Man (Rem)

Roentgen equivalent man (rem) is a unit of radiation dose equivalent that describes not only the amount of radiation that a human is exposed to, but also the biological damage that can result from exposure to the various types of radiation. The actual numerical value is computed by multiplying the exposure in rads (*i.e.,* absorption of 1 x 10^{-2} Joules of **energy** per kilogram of matter) by a normalizing factor that takes into account the fact that alpha rays cause more damage to human tissue than either x-ray or **gamma radiation**. The normalizing factor for x-ray and gamma radiation is unity. The dosage equivalent in rems for x-ray and gamma radiation is simply the dosage in rads. The normalizing factor for exposure to alpha particles is 20, for thermal neutrons is two, for fast neutrons is 10, for protons is 10, and for beta particles is one.

The National Council on Radiation Protection (NCRP) and Measurements recommends that the annual dosage for nonoccupational exposure not exceed 0.17 rem above the background radiation. For occupational exposure, the current federal safety standard is set at 5 rems per person per year. The average American is exposed to approximately 0.1-0.2 rem per year from natural sources such as cosmic rays, **radon** in the air and transuranic elements in various building materials, and from medically-related procedures such as diagnostic chest and dental x rays. Research and medical personnel who are exposed to radiation on a daily basis are required to wear a radiation badge, which contains unexposed pieces of photographic film. The darkening of the film is used as an index to measure the total amount of radiation that a person was exposed to during the time period that the badge was worn. Exposure to large radiation dosages can be lethal, or can lead to cancer and birth defects.